PATENT SPECIFICATION (11) 1 478 881

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(21) Application No. 24962/74 (22) Filed 5 June 1974 (19)

(31) Convention Application No. 7 322 195

(32) Filed 14 June 1973 in

(33) Fed. Rep. of Germany (DT)

(44) Complete Specification published 6 July 1977

(51) INT. CL.[2] F16C 33/30

(52) Index at acceptance

F2A 173 D62 D64

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(54) ROLLING-BEARING CAGE

(71) We, WILHELM SCHAEFFLER and GEORG SCHAEFFLER, both German citizens, both of 8522 Herzogenaurach, Germany, trading as INDUSTRIEWERK SCHAEFFLER OHG, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The invention relates to a rolling-bearing cage comprising rings of different widths connected together by cross-pieces, and produced by rolling round a flat strip and forming welded butt joints between end edge portions of the said strip.

Such cages are known, there being different reasons for the fact that the rings have different widths. For example, such a construction may be adopted if, for some reason or other, the rolling bodies are required to roll off-centre on the corresponding races. It is, however, also possible that a wider ring may be required because it has to perform additional tasks, for example with regard to lubrication, sealing or the like. In double rolling-bearing cages, it is furthermore customary to make the middle ring, lying between the two rows of rolling bodies, wider than the two outer rings.

In the manufacture of such cages, welding problems arise because, owing to the different cross-sections of the rings, the loss of material that occurs during welding is very different, which may result in defective welds.

The object of this invention is to eliminate these drawbacks by very simple means and to provide a cage in which the welds are satisfactory.

According to the invention there is provided a rolling-bearing cage having a wider ring and a narrower ring connected together by cross-pieces and produced by rolling round a flat strip and forming welded butt-joints between butt-joint surfaces at the end faces of the ring-forming parts of the strip characterised by one or more end face portions of the wider ring-forming part of the strip being set back from the butt-joint so that the end faces of the wider ring-forming part of the strip each have one or more butt-joint surfaces each substantially equal in area to the area of the butt-joint faces of the narrower ring.

With this arrangement, instead of butt-joint surfaces of different areas, a number of surfaces of equal area is provided, on which surfaces the loss conditions in welding are the same.

In some cases, it may be expedient to provide the end faces of the wider ring-forming part of the strip with recesses, forming set-back portions, on both lateral edges, whereby a butt-joint surface is formed in the middle of the ring. This butt-joint surface then corresponds, according to the invention, in its cross-section to the cross-section available for welding on the narrower ring. It may, however, be expedient to provide each of the end faces of the wider ring-forming part of the strip with a centrally located recess, so that butt-joint surfaces are formed on both sides of this ring. Two welding places are then available, whereby the strength is increased in the region of these welds.

Embodiments of the invention will now be described with reference to the accompanying drawings, in which:

Fig. 1 is a perspective view of a cage according to one embodiment of the invention,

Fig. 2 is a fragmentary plan view of a portion of a strip as used for making a cage according to another embodiment of the invention,

Fig. 3 is a fragmentary plan view illustrating a modification of the strip shown in Fig. 2, and

Fig. 4 is a plan view of a flat strip for the production of a two-row rolling-bearing cage.

The rolling-bearing cage of Fig. 1 comprises a narrower ring 1, a wider ring 2 and cross-pieces 3 connecting the rings 1 and 2 together. This cage is produced by rolling

round a flat strip and forming butt-welded joints 4 between the ends of the ring-forming parting of the strip. On each end face of the wider ring-forming part 2 of the strip at the joint 4, a recess 5 is provided, whereby the joint is sub-divided into two parts, each of which corresponds in cross-section to that at the joint in the narrower ring 1 in that each part of the joint is formed between butt-joint surfaces each substantially equal in area to the area of the butt-joint faces of the narrower ring 1.

The portion of a flat sheet-metal strip shown in Fig. 2 has differently shaped end edges on the parts thereof which will form the narrower ring 1 and the wider ring 2 respectively of the cage. The end part 6 of the narrower ring-forming part 1 is essentially of trapezoidal form. This formation, which is chamfered at the corners, is usual and its purpose is to enable excess weld metal to flow into the recesses between the chamfered corners of the abutting ends of the ring when the strip is bent round. The corresponding end face of the ring-forming part 2 is set back at the lateral places 7 so that there is left in the middle an end part 8 corresponding essentially in transverse section to the end part 6 on the ring-forming part 1.

The strip shown in Fig. 3 differs from that of Fig. 2 merely in regard to the shape of the end of the wider ring-forming part 2. This ring-forming part 2 is provided in its end face with a central depression 9 so that two projecting parts 10 are left, one on each side of the depression 9, each part 10 corresponding essentially to the end part 6 of the narrower ring-forming part 1.

Finally, Fig. 4 shows in plan a flat strip serving for the production of a two-row cage. The latter comprises two lateral narrower ring-forming parts 1, a middle wider ring-forming part 2 and cross-pieces 3, connecting the said ring-forming parts together. The shapes of the end faces of the ring-forming parts of the strip here correspond fully to the shapes shown in Fig. 3 for a one-row cage.

WHAT WE CLAIM IS:—

1. A roller-bearing cage having a wider ring and a narrower ring connected together by cross-pieces and produced by rolling round a flat strip and forming welded butt-joints between butt-joint surfaces at the end faces of the ring-forming parts of the strip characterised by one or more end face portions of the wider ring-forming part of the strip being set back from the butt-joint so that the end faces of the wider ring-forming part of the strip each have one or more butt-joint surfaces each substantially equal in area to the area of the butt-joint faces of the narrower ring.

2. A rolling-bearing cage according to claim 1, characterised in that the end faces of the wider ring-forming part of the strip have set-back portions on both sides of a butt-joint surface provided in the middle of the ring.

3. A rolling-bearing cage according to claim 1, characterised in that the end faces of the wider ring-forming part of the strip each have a centrally located recess, whereby butt-joint surfaces are formed on both sides of the recess.

4. A rolling-bearing cage substantially as described with reference to Figs. 1, 2, 3 or 4 of the accompanying drawings.

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Printed for Her Majesty's Stationery Office by Burgess & Son (Abingdon), Ltd.—1977.
Published at The Patent Office, 25 Southampton Buildings, London, WC2A 1AY,
from which copies may be obtained.

the cage slots which is obtained when the strip is bent-round, whilst the rollers are retained in the outer radial sense by a thin-walled and also offset bar portion, similarly to what is the case with cages made of thin-walled sheet metal. This constructional form on the one hand affords the advantage that retaining noses do not have to be formed subsequently on the cage, but instead they are obtained on the one hand by the profiling of the sheet metal strip and on the other hand by the appropriate punching of the slots, and there are additionally obtained at the portions of the sheet metal strip which are of relatively considerable thickness and which also adjoin in a desirable manner the ends of the rollers, relatively long guide zones for the rollers which are disposed in the roller pitch circle. In addition, such a cage is made extremely stable in form by the considerable wall thickness provided at its axial ends, so that no undesirable deformations can result when the strip is bent-round.

One constructional embodiment for carrying out the method according to the invention is illustrated, by way of example in the accompanying drawings, wherein:

Figure 1 shows a flat sheet metal strip partly in its initial state and partly with slots punched in it;

Figure 2 is a sectional view on the line II-II in Figure 1;

Figure 3 is a plan view of a part of the sheet metal strip shown in Figure 2;

Figure 4 is a cross-section through the sheet metal strip after the offsetting of the bars; and

Figure 5 is a fragmentary view of the finished cage, after the rollers have been introduced into the cage.

The method according to the invention starts with a blank consisting of a flat and straight sheet metal strip 1 of such a cross-section that at both longitudinal edges 2 it has a thickness amounting to approximately half the roller diameter and in the region between the edges the strip has at one side a groove-like recess 3 which is such a depth that in the central region 4 the thickness of the material amounts to approximately 1/4 of the roller diameter. Slots 5 are punched in the strip for accommodating the rollers, these slots being slightly wider than the roller diameter in the regions 2, whilst in the region 4 they are narrower than the roller diameter.

Figure 2 shows a cross-section through the flat sheet metal strip 1 after the slots have been punched in it. The Figure also shows clearly the cross-sectional form of the sheet metal strip and it also shows that at the ends of the punched slots 5 portions of material 6 remain which in the finished cage form end rings connecting the cage bars 7 to one another.

Figure 3, which is a plan view of the punched cage strip, shows that the slot 5 is punched so that it has different widths in such a manner that in the region 4 of the cage bars 7 the slot is narrower than the diameter of the rollers which later will be inserted into the cage.

Figure 4 shows the flat sheet metal strip 1 in the state in which it is to be found after the next step in the method has been carried out. In this step, the cage bars 7 are so offset in their central region 4 that a total cage thickness x is obtained which amounts to approximately 3/4 of the roller diameter. This offsetting enables the bar portion 4 to retain the roller 8 (shown in dot-dash lines) in one direction due to the fact that the bar portions 4, which are spaced from one another at a distance which is less than the roller diameter, are situated at one side of the roller centre line or pitch circle 9 which is indicated by a dot-dash line.

In the next step of the method, the sheet metal strip thus prepared is bent to a semi-cylindrical or cylindrical shape whereby there is obtained a cage such as is shown in the fragmentary view in Figure 5, the section illustrated being on the line V-V in Figure 4. This sectional view shows how when the strip is bent-round, the surfaces of the bar portions 2 which face towards the cage slots 7 approach one another in the radial inward direction, which guarantees that the rollers 8 shall be retained in the radial inward direction. Figure 5 also shows how the rollers are retained externally by the offset bar portions 4, which also are wider than the bar portions 2. The rollers 8 may be snapped from the outside into such a cage in known manner, the bar portions 4 yielding elastically in the peripheral direction during this snapping-in operation.

WHAT WE CLAIM IS:—

1. A cage for cylindrical rollers in a roller bearing, comprising two annular rims connected to one another by bars which bound slots for accommodating the rollers and guide the rollers in axially-parallel manner and retain them in both radial directions, the cage being characterised in that the bars comprise portions of differing radial thickness over their length, these portions being at different distances from the cage axis, the thickest bar portions extending radially within the pitch circle of the rollers or projecting outwardly beyond the pitch circle to only a slight extent, the slot-bounding surfaces of the thickest bar portions being inclined at an acute angle to one another so that the edges of these bar portions in the inside of the

cage are spaced from one another across each slot at a distance which is less than the roller diameter and the thinnest bar portions being disposed exclusively radially-outwardly of the pitch circle of the rollers and their radially-innermost slot-bounding edges being spaced from one another across each slot at a distance which is less than roller diameter.

2. A method of manufacturing a cage as claimed in claim 1, in which slots for accommodating rollers are punched in a flat rectilinear sheet-metal strip which is of such a cross-section that at both longitudinal edges it has a thickness amounting to approximately half the roller diameter, and in the region situated between the edges at one side it has a groove-like recess of such dimension that there is a thickness of material of about 1/4 of the roller diameter, the slots being punched transversely to the longitudinal direction of the strip and being slightly wider than the roller diameter in their end-regions where the sheet metal strip has a greater thickness of material, whereas the slots are narrower than the roller diameter in their central region where the sheet metal strip has a smaller thickness of material, the central region of the sheet metal strip with a thickness of material of about 1/4 of the roller diameter being brought into an offset position in the direction opposite to the groove-like recess, before or after the punching of the slots, so as to result in a total cage thickness amounting to approximately 3/4 of the roller diameter, and the sheet metal strip being bent to a semi-cylindrical or cylindrically-shaped cage, the offset central bar portions of which are situated on the outer periphery of the cage.

3. A cage for cylindrical rollers in a roller bearing, substantially as described with reference to the accompanying drawings.

4. A method of manufacturing a cage for cylindrical rollers in a roller bearing, substantially as described with reference to the accompanying drawings.

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Berwick-upon-Tweed: Printed for Her Majesty's Stationery Office by The Tweeddale Press Ltd.—1967.
Published at the Patent Office, 25 Southampton Buildings, London, W.C.2 from which copies may be obtained.

FIG. 2

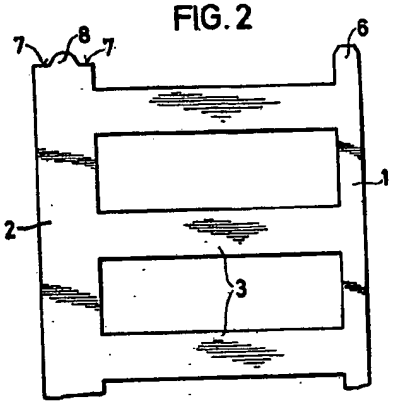
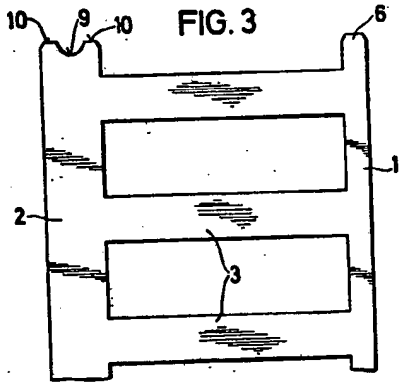


FIG. 3



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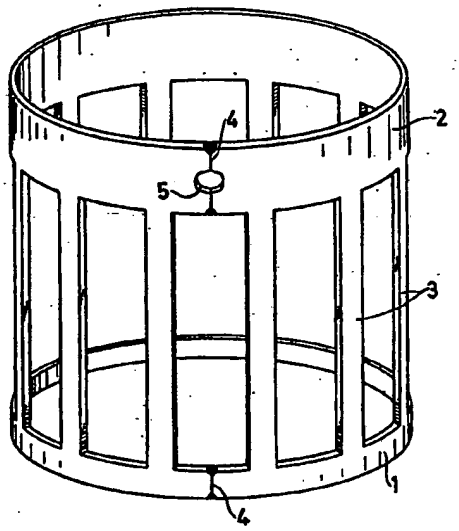
Sheet 1

FIG.1



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Sheet 3

FIG. 4